

Claims

1. An optical amplifier module containing at least one optical amplifier, said module comprising:
 - an internal housing having an outer dimension substantially equal to an outer dimension of an internal fiber splice housing of an undersea optical fiber cable joint, said internal housing including:
 - a pair of opposing end faces each having a retaining element for retaining the internal housing within an outer housing of said undersea optical fiber cable joint;
 - a sidewall interconnecting said opposing end faces and extending between said opposing end faces in a longitudinal direction, said sidewall including a receptacle portion having a plurality of thru-holes each being sized to receive a passive optical component employed in an optical amplifier.
2. The optical amplifier module of claim 1 wherein said plurality of thru-holes laterally extend through said receptacle portion of the sidewall in the longitudinal direction.
3. The optical amplifier module of claim 1 wherein said internal housing has a generally cylindrical shape, said receptacle portion of the sidewall having a curvature that defines a diameter of the cylindrical shape.
4. The optical amplifier module of claim 1 wherein the undersea optical fiber cable joint is a universal joint for jointing optical cables having different configurations.
5. The optical amplifier module of claim 1 wherein said universal joint includes a pair of cable termination units in which end portion of the optical cables to be jointed are respectively retained, said retaining elements each being connectable to one of the cable termination units.

6. The optical amplifier module of claim 1 wherein said retaining elements each include a flange through which at least one optical fiber extending from the end portion of one of the optical cables extends into the internal housing.
7. The optical amplifier module of claim 1 further comprising an optical fiber storage area located within said internal housing.
8. The optical amplifier module of claim 1 further comprising a support member for supporting at least one circuit board on which reside electronics associated with the optical amplifier.
9. The optical amplifier module of claim 1 wherein said optical fiber storage area includes at least one optical fiber spool around which optical fiber can be wound.
10. The optical amplifier module of claim 1 wherein said internal housing is formed from a pair of half units each having a mating surface extending in a longitudinal plane that includes the longitudinal direction, said half units being interconnected to one another along said mating surfaces.
11. The optical amplifier module of claim 1 wherein said support member supporting the circuit board is arranged so that the circuit board and the mating surface form a substantially continuous plane.
12. The optical amplifier module of claim 1 wherein said support member is defined by a lip extending inwardly from, and recessed below, said mating surface.
13. The optical amplifier module of claim 1 wherein said sidewall includes a pair of ribbed members extending longitudinally from the receptacle portion of the sidewall, said ribbed members each having a tension rod thru-hole extending

laterally therethrough in the longitudinal direction for supporting a tension rod employed by the undersea optical fiber cable joint.

14. The optical amplifier module of claim 1 wherein the outer dimension of the internal housing is less than about 15 cm x 50 cm.

15. The optical amplifier module of claim 1 wherein the outer dimension of the internal housing is about 7.5 cm x 15 cm.

16. In an external, hermetically sealed outer housing of an undersea optical fiber cable joint, an optical amplifier module comprising:
a protective sleeve;
an internal housing located in said protective sleeve, said internal housing including:

a pair of opposing end faces each having a retaining element for retaining the internal housing within an outer housing of said undersea optical fiber cable joint; and

a sidewall interconnecting said opposing end faces and extending between said opposing end faces in a longitudinal direction, said sidewall including a receptacle portion having a plurality of thru-holes each being sized to receive a passive optical component employed in an optical amplifier.

17. The optical amplifier module of claim 16 wherein said plurality of thru-holes laterally extend through said receptacle portion of the sidewall in the longitudinal direction.

18. The optical amplifier module of claim 16 wherein said internal housing has a generally cylindrical shape, said receptacle portion of the sidewall having a curvature that defines a diameter of the cylindrical shape.

19. The optical amplifier module of claim 16 wherein the undersea optical fiber cable joint is a universal joint for jointing optical cables having different configurations.
20. The optical amplifier module of claim 16 wherein said universal joint includes a pair of cable termination units in which end portion of the optical cables to be jointed are respectively retained, said retaining elements each being connectable to one of the cable termination units.
21. The optical amplifier module of claim 16 wherein said retaining elements each include a flange through which at least one optical fiber extending from the end portion of one of the optical cables extends into the internal housing.
22. The optical amplifier module of claim 16 further comprising an optical fiber storage area located within said internal housing.
23. The optical amplifier module of claim 16 further comprising a support member for supporting at least one circuit board on which reside electronics associated with the optical amplifier.
24. The optical amplifier module of claim 16 wherein said optical fiber storage area includes at least one optical fiber spool around which optical fiber can be wound.
25. The optical amplifier module of claim 16 wherein said internal housing is formed from a pair of half units each having a mating surface extending in a longitudinal plane that includes the longitudinal direction, said half units being interconnected to one another along said mating surfaces.
26. The optical amplifier module of claim 16 wherein said support member supporting the circuit board is arranged so that the circuit board and the mating surface form a substantially continuous plane.

27. The optical amplifier module of claim 16 wherein said support member is defined by a lip extending inwardly from, and recessed below, said mating surface.

28. The optical amplifier module of claim 16 wherein said sidewall includes a pair of ribbed members extending longitudinally from the receptacle portion of the sidewall, said ribbed members each having a tension rod thru-hole extending laterally therethrough in the longitudinal direction for supporting a tension rod employed by the undersea optical fiber cable joint.

29. The optical amplifier module of claim 16 wherein the outer dimension of the internal housing is less than about 15 cm x 50 cm.

30. The optical amplifier module of claim 16 wherein the outer dimension of the internal housing is about 7.5 cm x 15 cm.

31. The optical amplifier module of claim 1 wherein said undersea optical fiber cable joint is a universal cable joint.

32. The optical amplifier module of claim 16 wherein said undersea optical fiber cable joint is a universal cable joint.

33. An undersea optical repeater, comprising:
an external, hermetically sealed outer housing of an undersea optical fiber cable joint, an optical amplifier module comprising:
a protective sleeve located in said outer housing;
an internal housing located in said protective sleeve, said internal housing including:
a pair of opposing end faces each having a retaining element for retaining the internal housing within an outer housing of said undersea optical fiber cable joint; and

a sidewall interconnecting said opposing end faces and extending between said opposing end faces in a longitudinal direction, said sidewall including a receptacle portion having a plurality of thru-holes each being sized to receive a passive optical component employed in an optical amplifier.

34. The undersea optical repeater of claim 33 wherein said plurality of thru-holes laterally extend through said receptacle portion of the sidewall in the longitudinal direction.

35. The undersea optical repeater of claim 33 wherein said internal housing has a generally cylindrical shape, said receptacle portion of the sidewall having a curvature that defines a diameter of the cylindrical shape.

36. The undersea optical repeater of claim 33 wherein the undersea optical fiber cable joint is a universal joint for jointing optical cables having different configurations.

37. The undersea optical repeater of claim 33 wherein said universal joint includes a pair of cable termination units in which end portion of the optical cables to be jointed are respectively retained, said retaining elements each being connectable to one of the cable termination units.

38. The undersea optical repeater of claim 33 wherein said retaining elements each include a flange through which at least one optical fiber extending from the end portion of one of the optical cables extends into the internal housing.

39. The undersea optical repeater of claim 33 further comprising an optical fiber storage area located within said internal housing.

40. The undersea optical repeater of claim 33 further comprising a support member for supporting at least one circuit board on which reside electronics associated with the optical amplifier.

41. The undersea optical repeater of claim 33 wherein said optical fiber storage area includes at least one optical fiber spool around which optical fiber can be wound.

42. The undersea optical repeater of claim 33 wherein said internal housing is formed from a pair of half units each having a mating surface extending in a longitudinal plane that includes the longitudinal direction, said half units being interconnected to one another along said mating surfaces.

43. The undersea optical repeater of claim 33 wherein said support member supporting the circuit board is arranged so that the circuit board and the mating surface form a substantially continuous plane.

44. The undersea optical repeater of claim 33 wherein said support member is defined by a lip extending inwardly from, and recessed below, said mating surface.

45. The undersea optical repeater of claim 33 wherein said sidewall includes a pair of ribbed members extending longitudinally from the receptacle portion of the sidewall, said ribbed members each having a tension rod thru-hole extending laterally therethrough in the longitudinal direction for supporting a tension rod employed by the undersea optical fiber cable joint.

46. The undersea optical repeater of claim 33 wherein the outer dimension of the internal housing is less than about 15 cm x 50 cm.

47. The undersea optical repeater of claim 33 wherein the outer dimension of the internal housing is about 7.5 cm x 15 cm.

48. The undersea optical repeater of claim 33 wherein said undersea optical fiber cable joint is a universal cable joint.